Designation: ~~D5641 – 94 (Reapproved 2011)~~ D5641/D5641M – 16

Standard Practice for Geomembrane Seam Evaluation by Vacuum Chamber[1]

This standard is issued under the fixed designation ~~D5641;~~D5641/D5641M; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ε) indicates an editorial change since the last revision or reapproval.

1. Scope

1.1 This practice covers procedures to perform nondestructive quality control testing described in Practice ~~D4437~~D4437/D4437M and Practice D4545 for evaluating the continuity of all types of geomembrane seams using the bubble emission or vacuum chamber method.

1.2 The technique described in this practice is intended for use on geomembrane seams, patches, and defects.

1.3 The values stated in either SI units or inch-pound units are to be regarded separately as standard. The values ~~given in parentheses are for information only.~~ stated in each system may not be exact equivalents; therefore, each system shall be used independently of the other. Combining values from the two systems may result in non-conformance with the standard.

1.4 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.*

2. Referenced Documents

2.1 *ASTM Standards:*[2]

~~D4437~~D4437/D4437M Practice for Non-destructive Testing (NDT) for Determining the Integrity of Seams Used in Joining Flexible Polymeric Sheet Geomembranes

D4439 Terminology for Geosynthetics

D4545 Practice for Determining the Integrity of Factory Seams Used in Joining Manufactured Flexible Sheet Geomembranes (Withdrawn 2008)[3]

E515 Practice for Leaks Using Bubble Emission Techniques

2.2 *E.P.A. Documents:*

EPA/530/SW-91/051 Inspection Techniques for the Fabrication of Geomembrane Field Seams[4]

3. Terminology

3.1 *Definitions of Terms Specific to This Standard:*

3.1.1 *geomembrane, n*—an essentially impermeable geosynthetic composed of one or more synthetic sheets. (See Terminology D4439).

3.1.2 *seam, n*—the connection of two or more pieces of material by mechanical, chemical, or fusion methods to provide the integrity of a single piece of the material.

3.1.3 *vacuum chamber, n*—a device that allows a vacuum to be applied to a surface.

[1] This practice is under the jurisdiction of ASTM Committee D35 on Geosynthetics and is the direct responsibility of Subcommittee D35.10 on Geomembranes.

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[2] For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

[3] The last approved version of this historical standard is referenced on www.astm.org.

[4] Available from the ~~Superintendent of Documents,~~ U.S. Government ~~Printing Office, Washington, DC 20402.~~Publishing Office, 732 N. Capitol St., NW, Washington, DC 20401-0001, http://www.gpo.gov.

3.1.3.1 *Discussion*—

In geomembranes, typical seams would include adhesive bonded, bodied chemical fusion welds; chemical fusion welds; dielectric; dual hot wedge; fillet extrusion; flat extrusion; hot air; single hot wedge; and ultrasonic. (See EPA/530/SW-91/051.)

NOTE 1—For definition of other terms used in this practice, refer to Terminology D4439.

4. Summary of Practice

4.1 The basic principle of this practice consists of creating a pressure differential across a seam and observing for bubbles in a film of foaming solution over the low pressure side, within the vacuum chamber. The vacuum chamber has a viewing port that allows observation of the seam area being tested. The foaming solution is applied to the surface to be tested and the vacuum chamber is placed over the test area. As the chamber is held firmly in place, vacuum is applied. Air leakage through flaws in the test area cause bubbles in the foaming solution that may be observed.

5. Significance and Use

5.1 This practice is a nondestructive evaluation intended to be used for quality control purposes during factory or field seaming of geomembranes.

5.2 This practice may also be used to evaluate geomembrane panels for holes that penetrate the entire thickness of material. Limitations on the test practice are that it may not be suitable for uneven or curved surfaces, thick seams, seams in corners, and thin extensible geomembranes.

6. Apparatus

6.1 *Vacuum Pump*—The vacuum pump shall be fuel or electric powered and capable of sustaining the required vacuum for the duration of the test.

6.2 *Vacuum Gauge*—The vacuum gauge shall be capable of registering, as a minimum, to ~~70 kPa (10 psi)~~10 psi [70 kPa] in increments of ~~5 kpa (¾ psi).~~psi [5 kpa].

6.3 *Calibration and Adjustment*—The calibration of the vacuum gauge shall be checked and adjusted periodically, and routinely at a minimum of once every twelve months.

6.4 *Foaming Solution*—The foaming solution shall be pre-mixed with water at a ratio conducive to the formation of bubbles. It shall be dispensed by spray, brush, or any other convenient means. The foaming solution shall be compatible with the geomembrane.

NOTE 2—If the component to be tested has parts made of polyethylene or structural plastics, the test fluid must not promote environmental stress cracking (E.S.C.). (See Test Method E515.)

6.5 *Vacuum Chamber*—The vacuum chamber shall have an open bottom and a clear viewing panel on top. It shall be an appropriate and convenient size and shape, made of rigid materials and equipped with a vacuum gauge, valve, and soft pliable gasket around the periphery of the open bottom (see Fig. 1).

NOTE 3—Vacuum chamber equipment may be obtained from the suppliers given in Footnote 5.[5] These suppliers are cited only for convenience and

[5] Series A100 Straight Seam Tester supplied by the American Parts and Service Company, 2201 West Commonwealth Avenue, P.O. Box 702, Alhambra, CA 91802. Vacuum Chamber Test System as supplied by Sinclair Equipment Company, 6686 A Merchandise Way, Diamond Springs, CA 95619. Columbine International, Ltd., 5441 Merchant Circle, Placerville, CA 95667.

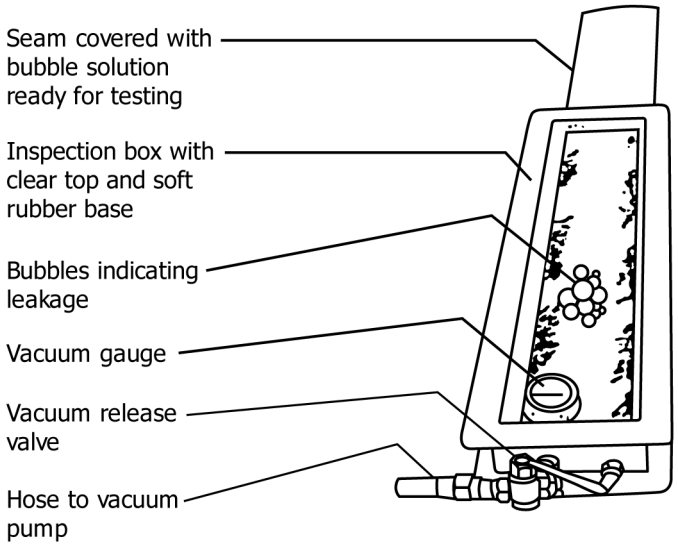

FIG. 1 Vacuum Chamber